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1RH

1. Your reference: SP/CT/N8511

2. Patent application number *(The Patent Office will fill this part)*: **9915331.4**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

WORLD GOLF SYSTEMS LTD
Canada House
272 Field End Road, Eastcote
Middlesex HA4 9NA

Patents ADP number *(if you know it)*: 7402036001

If the applicant is a corporate body, give the country/state of its incorporation: United Kingdom

4. Title of the invention

GOLF BALLS

5. Name of your agent *(if you have one)*: Williams, Powell & Associates

"Address for service' in the United Kingdom to which all correspondence should be sent *(including the postcode)*:
4 St. Paul's Churchyard
London
EC4M 8AY

Patents ADP number *(if you know it)*: 5830310001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority appliation number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earleir UK application, give the number and the filing date of the earlier application.

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or

YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	5
Claim(s)	2
Abstract	1
Drawing(s)	2 + 2

10. If you are filing one of the following, state how many against each item.

Priority documents	
translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/ we quest the grant of a patent on the basis of this application.

Signature

Date
30 June, 1999

12. Name and daytime telephone number of person to contact in the United Kingdom — Mr Lee Anderson 0171 329 4400

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Notes

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GOLF BALLS

The present invention relates to balls, especially golf balls, incorporating an identification device.

U.S. patent 5,743,815 discloses such an arrangement, in which a passive transponder is surrounded by elastic material and a rigid housing to produce a coded golf ball. U.S. 3,782,730 also shows a golf ball with an oscillator circuit which is surrounded by a resistant sphere and which is to aid location of the ball.

Coded golf balls are necessary in order to efficiently run golf driving ranges as those disclosed in our co-pending patent application PCT/GB99/00883.

A problem with prior arrangements is to provide a sufficiently reliable identification device which is robust enough to withstand the shock of repeated impacts with a golf club. Another problem is the need to withstand the extreme conditions of temperature and pressure required during the manufacture of golf balls. In addition the identification device should have no effect on the performance of the golf ball in use.

The present invention seeks to overcome or reduce one or more of the above problems.

According to a first aspect of the present invention, there is provided a golf ball having an identification device embedded therein, the identification device comprising a coded element and an aerial, wherein the coded element and/or the aerial is/are associated with a resilient member arranged to dampen mechanical shocks thereto.

The identification device is preferably a radio frequency identification device.

The coded element may be mounted in or on a plate with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.

In preferred arrangements the resilient member is in the form of a diaphragm and the coded element, in the form of a chip, is connected to the diaphragm. The aerial coil is separately connected to the diaphragm, so that the diaphragm may also serve to electrically connect the chip and the aerial coil.

The resilient member is preferably made of such a material that it can serve as a heat sink during subsequent manufacturing stages of the golf ball to prevent overheating of the coded element and/or the aerial.

According to a second aspect of the present invention, there is provided a method of manufacturing a golf ball incorporating an identification device, the method including the steps of moulding the identification device in a disc member, placing the disc member between two parts of a ball core, adhering the core parts to each other around the disc member, and then subjecting the thus-formed core to further processing steps, including providing it with a covering.

The core parts are preferably symmetrical and may be hemispherical of cuboid shape (to form a cuboid core which is subsequently processed to have a spherical shape).

Means for protecting the identification device from the effects of impacts are preferably also moulded in the disc member.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a top plan view of an identification device for use in an embodiment of the present invention;

Figure 2 shows a bottom plan view of the device of Figure 1;

Figure 3 shows the device of Figures 1 and 2 encapsulated in a capsule;

igure 4a and 4b show the device of Figure 3 is embedded in a core of cuboid shape; and

Figure 5 shows the core of Figure 4 after a further processing step.

Referring to the drawings, Figures 1 and 2 show an identification device 10 comprising a substrate formed by an insulating plate 11 e.g. of a plastics material such as any polyvinyl chloride product with the necessary temperature characteristics. The identification device is a passive device and includes an ASIC chip 12 with a 64 bit memory which can be read only or may have both read and write functions. The device operates at radio frequency preferably in the range 66kHz – 13.56 MHz. It also comprises a generally circular copper coil aerial 14 and arranged to receive interrogation signals from external readers and to transmit an appropriate response. The code within the coded response of the aerial 14 is stored in the memory of chip 12.

On the opposite major surface of plate 11, there is provided an annular or coiled shock absorbing member in the form of a steel diaphragm 16. Diaphragm 16 has a tongue 18 and a meandering section or castellation 19 which assists in bonding to the plate 11. The diaphragm is resiliently mounted, e.g. on a spring part, so as to protect the identification device from the impact of a golf club.

The physical arrangement is such that the chip 12 is mounted on the back of tongue 18 of the diaphragm 16 as seen in Figure 2; this enables the diaphragm to act as an effective heat sink for chip 12 during processing of the core. The chip 12 extends through a hole 22 in the plate 11 but without being directly attached to the plate. The aerial coil 14 is separately attached to the diaphragm 16 by a connection passing through the plate 11; this means that the diaphragm can serve as a conductive link for signals passing between aerial 14 and chip 12.

The plate 11, with the various components mounted thereon, is then located in a mould, and epoxy resin material 17 is then cast around it to form a capsule 20, Figure 3. The capsule provides high impact absorption and bonding for the plate arranged substantially along its

central plane. As the material of the capsule sets, the difference between the thermal set properties of the different materials enables the diaphragm to "set-back", giving room for relative movement after setting. Typical maximum dimensions of the capsule are diameter 17mm and depth 3.5mm.

As shown in Figures 4a and 4b, the capsule 20 is then positioned within a pre-manufacured soft synthetic rubber billet or core 35 of generally cuboid shape. This is done by slicing the spherical billet in half, cleaning the cut surfaces with solvent. coating the capsule with a bonding solution to improve adhesion and to prevent delamination, placing the capsule carefully at the centre of the billet 35, and bonding the two halves of the billet together again. Here, it is important that the capsule 20 is located centrally of the loaded synthetic rubber/chalk pre-manufactured core 35. This can be done manually or automatically with a specially-designed tool. The capsule 20 should be oriented with its major surfaces parallel to the major surfaces of the core 35.

The accurate location of the capsule 20 within each billet half, can be assisted by cutting or machining an appropriately shaped recess.

The billet is then subjected to a conventional manufacturing process during which it reaches temperatures of 200°C and pressures of up to 15.4 MN/m^2 (1ton/square inch) as the rubber compound vulcanises and adopts a spherical form 35', Figure 5. During the heating process, the diaphragm 16 further serves as a heat sink for the chip 12 and the rest of the identification device, which is thus prevented from thermal damage. A conventional dimpled cover of material sold under the trade name of Surlyn or similar material is subsequently applied as the outer layer of the ball.

A ball manufactured as above is within the normal weight specification (maximum 45.93 grams) and performs exactly as a normal ball, i.e. it looks and feels the same and the presence of the identification device does not affect the flight, trajectory, run, distance or dispersion of the ball in use.

In addition, alternative arrangements may be provided for absorbing shocks. For example, in one modification, electronic circuitry is mounted on an aerial coil which in turn is mounted on a spring.

The identification system could be used in other sorts of balls, e.g. tennis balls, or any other type of object which undergoes rough treatment.

Instead of uniquely identifying the ball or other object, the device may simply be part of a presence-sensing system, e.g. as an aerial to locating lost golf balls.

CLAIMS

1. A golf ball having an identification device embedded therein, the identification device comprising a coded element and an aerial, wherein the coded element and/or the aerial is/are associated with a resilient member arranged to dampen mechanical shocks thereto.

2. A golf ball according to claim 1, wherein the identification device is a radio frequency identification device.

3. A golf ball according to claims 1 or 2, wherein the coded element, is mounted in or on a plate, with the aerial being formed by a coil arranged on one face of the plate and the resilient member being arranged on the opposite face of the plate.

4. A golf ball according to any preceding claim, wherein the resilient member is in the form of a diaphragm and the coded element is a chip which is connected to the diaphragm.

5. A golf ball according to claim 4, wherein the aerial is separately connected to the diaphragm.

6. A golf ball according to any preceding claim wherein the resilient member is made of such a material that it can serve as a heat sink.

7. A golf ball according to claim 6, wherein the material is steel.

8. A golf ball substantially as herein described with reference to the accompanying drawings.

9. A method of manufacturing a golf ball incorporating an identification device, the method including the steps of moulding the identification device in a disc member,

placing the disc member between two parts of a ball core, adhering the core parts to each other around the disc member, and then subjecting the thus-formed core to further processing steps, including providing it with a covering.

10. A method according to claim 9 wherein the core parts are symmetrical.

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11. A method according to claim 10, wherein the core parts form a core of cuboid shape and are subsequently processed to have a spherical shape.

12. A method according to any of claims 9 to 11, wherein means for protecting the identification device from the effects of impacts are also moulded in the disc member.

13. A method of manufacturing a golf ball substantially as herein described with reference to the accompanying drawings.

ABSTRACT

Golf Balls

A golf ball having an identification device 10 embedded in it comprises an aerial 14 and a coded chip 12, which are associated with a resilient member 16 arranged to dampen shock from impact. The resilient members is in the form of a diaphragm 16, to which the chip 12 and aerial 14 are separately connected . The above components, mounted on an insulating plate 11, are moulded in a capsule 20 which is then placed at the centre of a golf ball core.

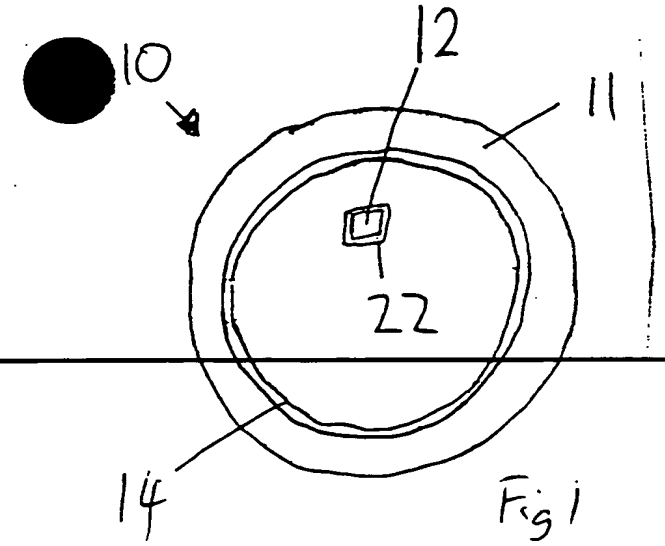

Fig 1

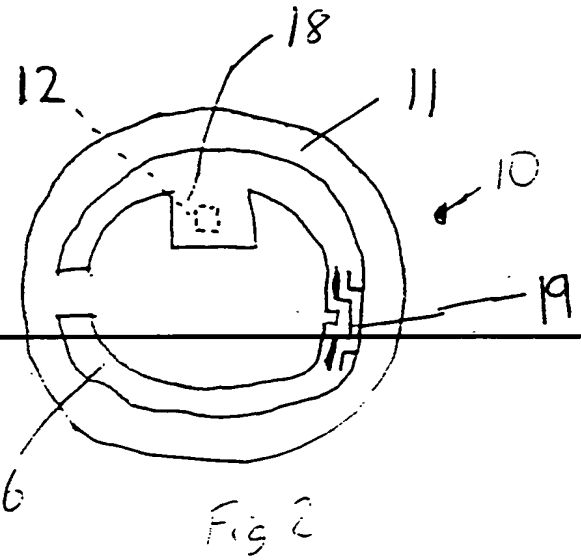

Fig 2

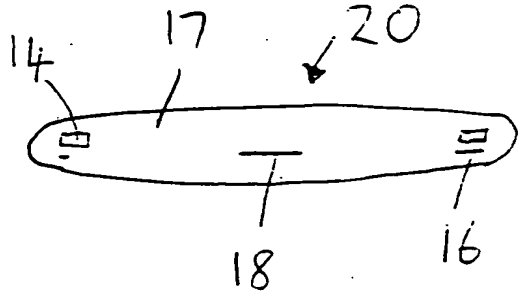

Fig 3

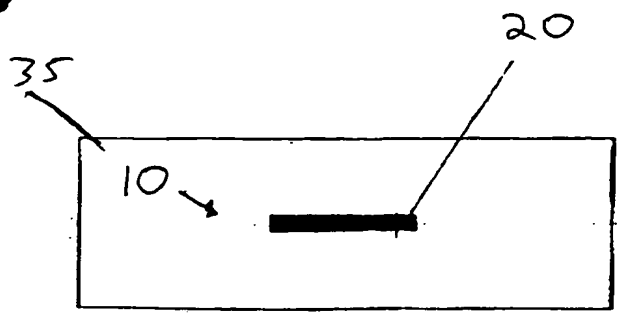

Fig 4a

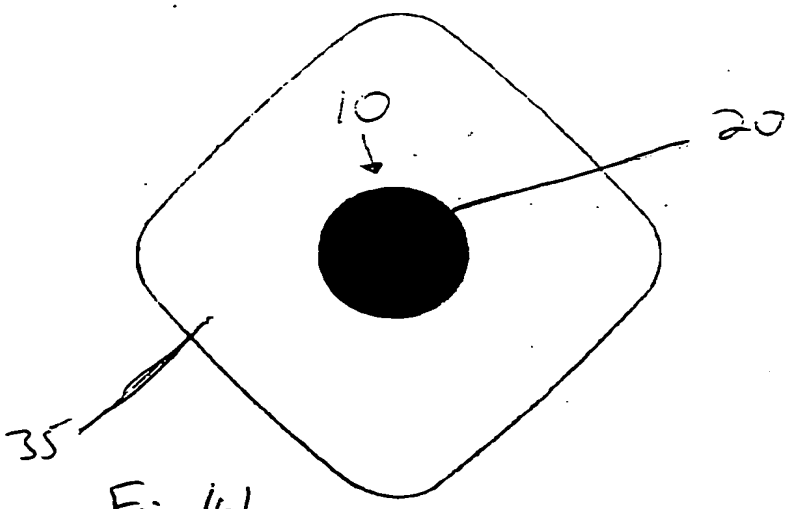

Fig 4b

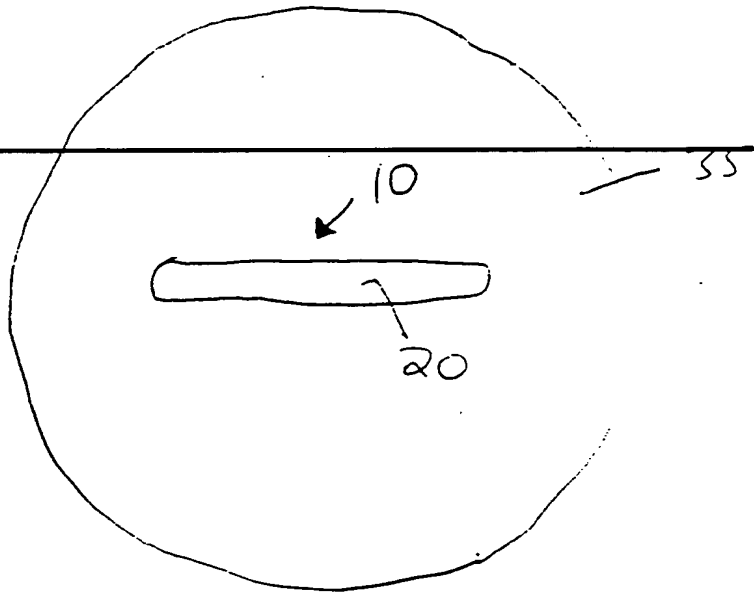

Fig 5